REEBIE

MEMORANDUM

TO: MR. GEORGE CONNER

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FROM: JIM BLAIR -- REEBIE ASSOCIATES

SUBJECT: I-81 TOLL IMPACT ANALYSIS

DATE: 2/12/2004

CC: RANJEET RATHORE -- DRPT

PURPOSE OF UPDATE

At the request of the Advisory Panel, we have prepared a summary of the methodology and of the preliminary findings for the Interstate 81 Toll Impact Analysis.

The two current proposals for I-81 expansion, from STAR Solutions and Fluor Virginia, Inc. seek to finance a portion of the construction costs with truck and car tolling. While each has recognized the potential for tolling to divert traffic to parallel secondary routes, the impact of these diversions on Virginia highways and the Commonwealth's economy have not been fully quantified.

The I-81 Toll Impact Analysis seeks to quantify the potential truck diversion of various rates of tolling on I-81 through Virginia, and to scale the potential economic impact of these diversions on Virginia's industrial base.

STUDY METHODOLOGY

The analysis undertaken by Reebie Associates seeks to predict the highway routing behavior of motor carriers given the application of tolls to the Virginia portion of Interstate 81. Using information obtained from motor carriers, proprietary cost models, and the knowledge of several industry experts, we hypothesized that the selection of a highway route would depend upon a variety of quantitative and qualitative factors. These include the following:

- The cost of the toll
- The relative service penalty of various alternative routes
- The corporate policies of motor carriers with respect to tolls, driver reimbursements, and service performance

- The relative value of the commodity transported, and the specific service requirements of the shipper and consignee

- The relative scope and size of the motor carrier and their familiarity with alternative routes

Through a series of personal and telephone interviews, we have constructed a series of decision rules which when applied to the current movements in the corridor allow us to predict the route selection behavior of informed drivers currently operating on Interstate 81. Factors were quantified to accommodate the behaviors of different classes of motor carriers, hauling different commodities, in different types of vehicles, from different origin and destination pairs.

PRELIMINARY FINDINGS

While the analysis is continuing, our preliminary findings are notable both for their impact, and their character.

Our analytical methodology contemplates an iterative approach, seeking to validate the results of the modeling with industry experts and selected motor carriers. Working from a sample of lanes extracted from a database of 1.8 million records, we have found the following:

- While I-81 serves as an efficient truck route between Southern States and the Northeastern US, there are several alternative interstate routings that can provide competitive service to the major industrial and population centers in the Eastern half of the United States. While some of these alternative routings utilize Virginia highways such as I-95, many bypass the Commonwealth altogether.

- Long-haul freight moving on I-81 generally will not reroute to US 11, or US 29 in Virginia, but rather will move towards I-95 to the east, or towards I-79 to the west. Shorter-haul freight will opt for US 11 or US 29, depending on the number of I-81 toll miles that must be traversed. In some cases, the alternatives to a tolled I-81 are so circuitous that motor carriers have no economic alternative to the highway. Currently on I-81, long-haul freight (movements of 1000 miles or greater from origin to destination) represent approximately 49% of all highway truck movements

- The analytical evidence suggests that the longer the length-of-haul, the more easily a motor carrier is able to mitigate the impacts of I-81 tolling. Based on the preliminary findings, the average length of haul for I-81 movements is about 1000 miles – relatively long by motor carrier standards, and over one-day's drive. This suggests that long-haul movements will divert from the tolled I-81 more readily to alternative highways, leaving shorter-haul movements to pay the toll costs on the highway.

- The sample results suggest that motor carriers experience an average penalty of between 30 and 40 miles to reroute around a tolled I-81. But while the average is small, overall mileage penalties range between -60 and 300 miles[1].

[1] Mileage penalties that are negative occur when an alternative route is shorter than the favored route. Motor carriers will traditionally trade-off mileage and time such that longer faster routes will attract more freight than slower shorter routes.

- The time cost or routing around a tolled I-81 ranges from -2 to 10 hours of penalty, with the average being just over 1.5 hours.

- The average cost penalty for rerouting around a tolled I-81 is about $66, although it goes as high as $450. This suggests that tolls that exceed the cost penalty amount (for each origin-destination pair) will stimulate diversions from I-81 to alternative highway routes. This occurs at various levels of toll for various origin-destination pairs, truck types, and commodities.

- Movements on I-81 average approximately 200 Virginia miles on that road, with some movements recording as few as 1 mile, while others record the entire length of the Virginia portion at 325 miles.

In the analysis, we have assumed that tolls are applied uniformly across the highway on a per-mile basis. This methodology reflects the stated assumptions in the Fluor and STAR proposals, and it suitable for modeling, but is seldom observed in practice.

Our assumption is that informed motor carriers will select an alternative route when the economic benefit of an I-81 routing exceeds the economic cost. Thus, when the cost of tolls more than offsets the time efficiency of an I-81 routing, the motor carrier will divert to another route.

Using the data collected from motor carriers operating in the corridor and the data developed from the sample analysis, we have developed the following preliminary results:[2]

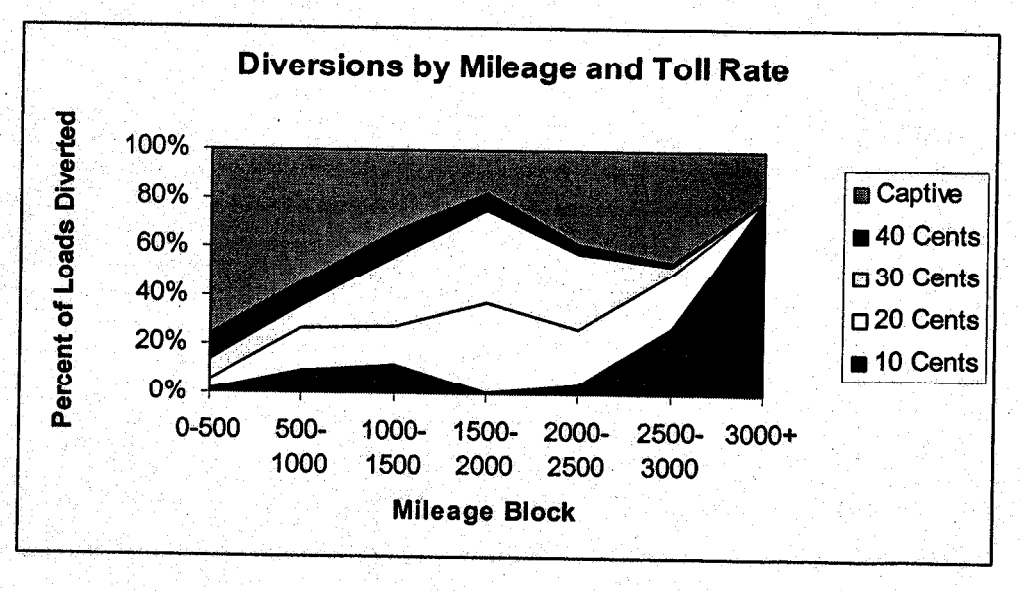
Figure 1

Percentage of Loads Diverting		
Toll Cost Per Mile	Low Sample Estimate	High Sample Estimate
$ 0.05	10.0%	20.0%
$ 0.10	10.0%	20.0%
$ 0.15	20.0%	30.0%
$ 0.20	30.0%	40.0%
$ 0.25	30.0%	50.0%
$ 0.30	40.0%	50.0%
$ 0.35	50.0%	60.0%
$ 0.40	50.0%	70.0%

As would be anticipated, diversions vary by the origin to destination mileage, with longer-haul traffic more easily diverted than short-haul traffic. This circumstance arises from the ability of long-haul movements to circumvent I-81 with a number of competitive alternative routes versus short-haul movements that are often "economically captive" to an I-81 routing. For these movements, the available alternative routings would create a time and/or mileage penalty that is more costly than paying the toll on I-81. Figure 2 illustrates the impact of various toll rates on diversions of traffic in different mileage blocks.

[2] While the analysis is still incomplete, we expect these results to be within 10% of the final results based on the statistical sampling methodology used for the preliminary results.

Figure 2



By way of example, a highway movement from Hartford County, Connecticut to Walton County, Georgia (east of Atlanta) – a movement of 974 miles, with 241 miles on Interstate 81—currently chooses an I-81 routing because of lower total cost versus I-95 and I-85. With the application of a toll of $.15 per mile to the I-81 portion of its journey, the economics shift back to I-95/I-85 and the driver would be expected to divert from I-81, back to an I-95/I-85 routing.

Similarly, a highway movement from New Castle County, Delaware to Roanoke City, Virginia – a movement of 340 miles with 174 miles on Interstate 81 – has few economical alternatives to an I-81 routing. Thus at a tolls of up to about $.45 per mile, the driver would elect to maintain an I-81 routing. Higher tolls would finally make alternative routings using I-95 and US 29 economical, and thus cause an informed driver to select another route to avoid the toll.

For an average truck trip of 1000 miles, with 200 miles on I-81 in the Commonwealth, the penalty cost (time delay and additional mileage) of an alternative highway routing is approximately $66.00. The break-even point for this movement would occur at a toll of approximately $.33 per mile. At 100 miles on I-81 this same movement is economically captive to the highway – willing to pay up to about $.65 per mile in toll. At 325 miles on I-81 – the full length of the highway in Virginia – this same movement would divert at a toll rate of about $.20 per mile.

ECONOMIC IMPACT

The measured diversion impacts of I-81 tolling for the sample dataset suggest that a disproportionate portion of toll revenues will be borne by short and medium-haul (0-900 miles) highway movements, and higher value freight. A significant portion of this medium-haul freight

represents movements originating and terminating in the Commonwealth, and its neighboring states. This would suggest that Virginia businesses and consumers could be adversely impacted by the application of tolling to I-81. A summary evaluation of the impacted industries is just underway, but has yet to provide results. With the completion of the diversion analysis, this work can progress more quickly.

SAMPLE DATA

To help understand the context of the analysis, and to illustrate the suitability of available route alternatives, the following pages provide some sample maps displaying the current and alternative routes for two major traffic corridors.

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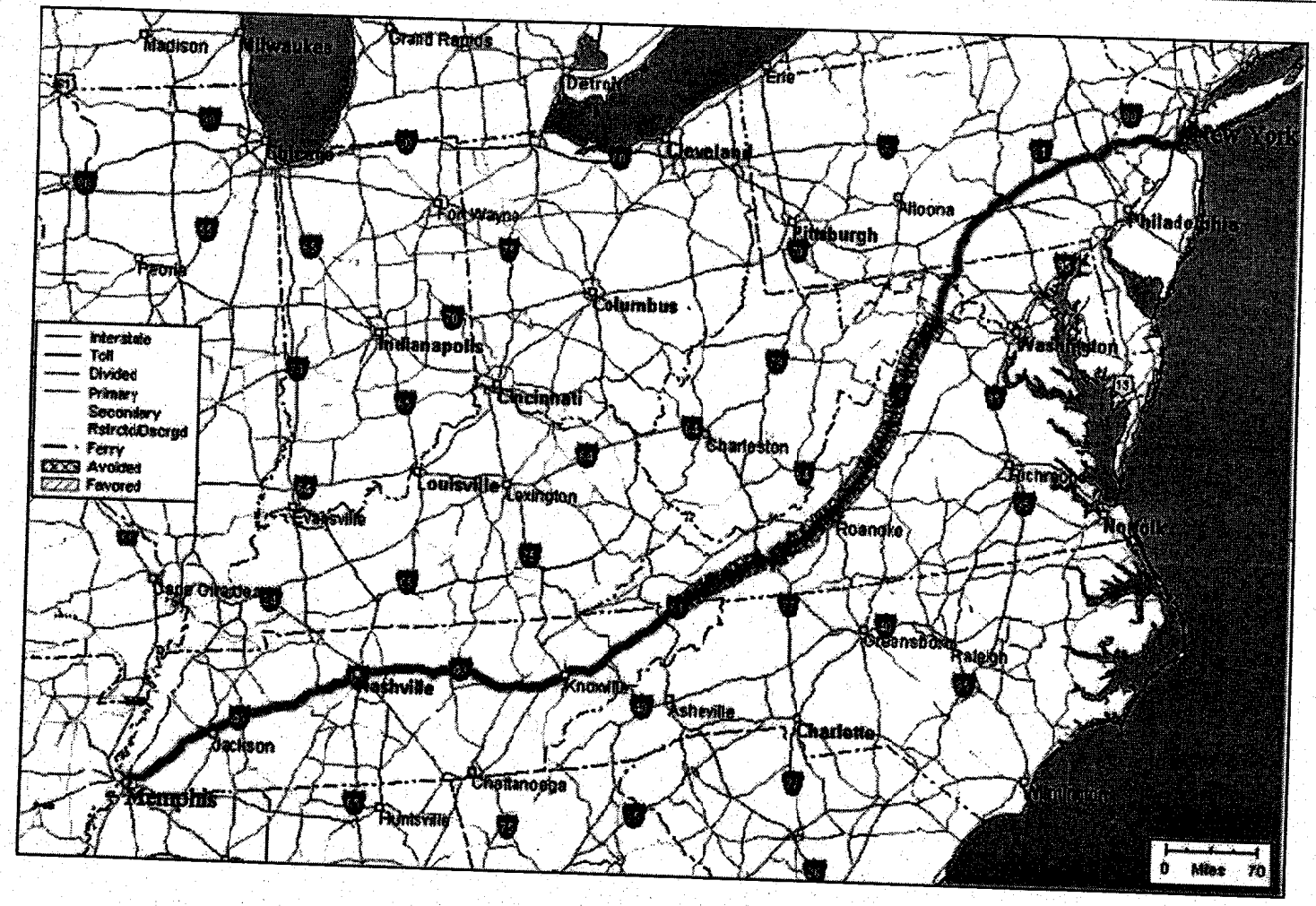
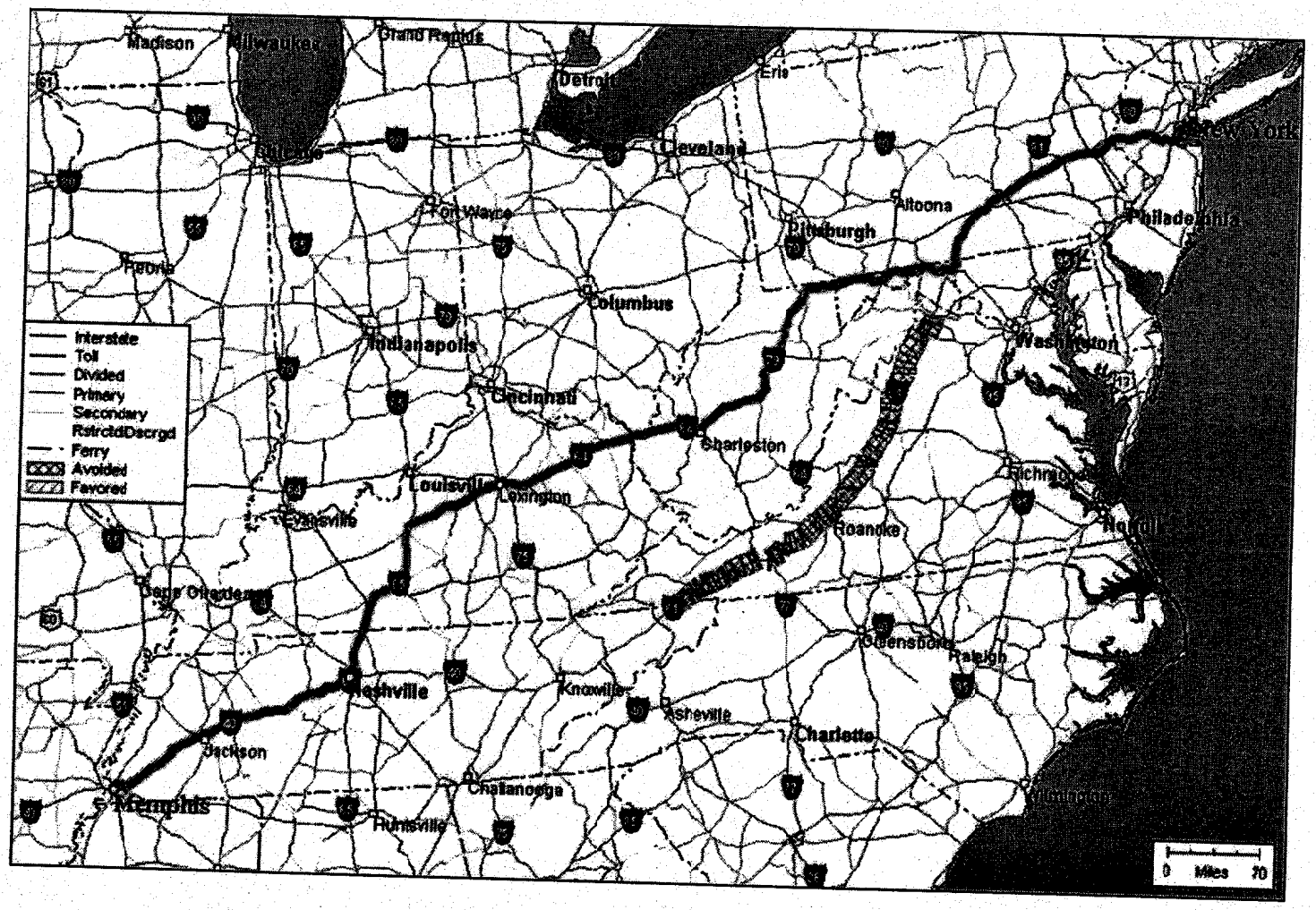
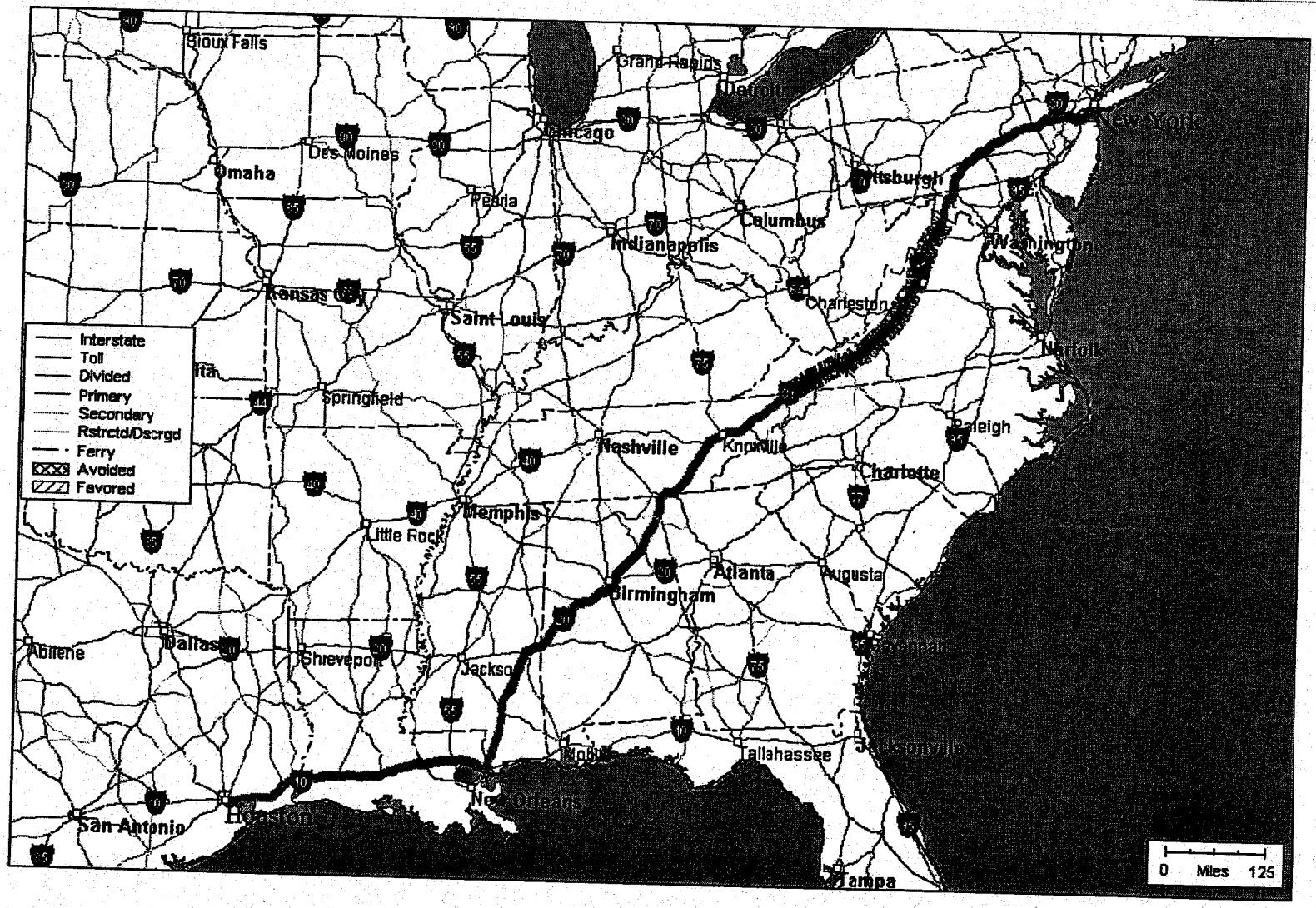
CURRENT ROUTING – MEMPHIS, TN TO NEW YORK, NY



NEXT-BEST ALTERNATIVE ROUTING – MEMPHIS, TN TO NEW YORK, NY



CURRENT ROUTING – HOUSTON, TX TO NEW YORK, NY



NEXT-BEST ALTERNATIVE ROUTING – HOUSTON, TX TO NEW YORK, NY